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W. E. DEMING, PRAGMATISM AND SUSTAINABILITY

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Abstract

W. Edwards Deming aims to contribute to the transformation of management systems which he considers responsible for losses caused the decline of our Societies. His latest book highlights the system of thought called "*System of Profound Knowledge*" which must lead to this transformation. The aim of our research is to explain the implicit assumptions of Deming's System of Profound Knowledge about ethics and sustainability and argues that they are related to the philosophy of pragmatism. We show how his recommendations on the role of individuals and the transformation of management systems can promote socially and sustainable responsible behaviour. Our guiding principle is the following. Finding connections between main pioneers of the classical American pragmatism movement to Deming, arguing pragmatism is an appropriate paradigm for some sustainable issues, and finally establishing a link between the System of Profound Knowledge and sustainability.

Introduction

W. Edwards Deming (1900-1993) is sometimes regarded as being « *the man who discovered quality* » (Gabor, 1990). He is widely recognized for his 14 key principles of management for transforming organizations and for his continuous quality improvement model known as the Plan-Do-Study-Act. Deming's "System of Profound Knowledge" tends to receive increased attention which therefore makes it interesting to further explore.

The main message of his books *Out of the Crisis* (1986) and *The New Economics for Business, Education, Government* (1993) is about helping people gain the knowledge for transformation to a new style of management. Transformation is required in government, industry and education. The first step of this process is the transformation of the individual. It comes from understanding the System of Profound Knowledge. This system included four topics, namely: understanding a system, understanding variation, psychology and the theory of knowledge. Deming asks us to wonder about the way our systems work and to understand why our systems vary. What makes people tick? And, finally, to consider how we know what we know? Moreover, he asks us to change our way of thinking. The importance of cultivating a new worldview would be both an essentially pragmatic and environmentalist idea (Reitan, 1998). Deming's System of Profound Knowledge uses pragmatic ideas to complement the scientific method and places man in the centre of the concerns of management and society.

According to the World Commission on Environment and Development (WCED) of the United Nations, sustainability or sustainable development is "*development that meets the needs of the present without compromising the ability of future generations to meet their own needs*" (WCED, 1987). From an ethical point of view, this definition calls to man in his responsibility towards the others and society. For citizens, sustainable development means daily gestures which protect the natural environment, an implication in the social and political life of the city and a contribution to the wealth of the local economy. For the company, sustainable development is a question of reconciling social equity, economic efficiency and environmental protection - the "*three pillars*" of sustainability.

The aim of this paper is to explain Deming's assumptions about ethics and sustainability and argues that they are related to the philosophy of pragmatism. The paper has three parts. Part One introduces W. Edwards Deming, his mentor W.A. Shewhart, the pragmatists' philosophers and Deming's system of profound knowledge. Part Two considers the way in which pragmatism, among other ethical bases, can foster sustainable development for organisations. Part Three explores the contribution to sustainability of Deming's profound knowledge system. Finally, we discuss the research implications and limitations of our research.

1. The Deming System of Profound Knowledge

W. Edwards Deming is often introduced as a quality « *guru* ». His 14 principles for management have been the subject of considerable controversy and debate (Evans, 2005). His recommendations seem to be simplistic or excessive. His work is characterised by a failure to acknowledge the body of management thought, economics, management or behavioural science literature (Clegg et al., 2008). Finally, he insists on the necessity of adopting a new philosophy of management but without in fact presenting it.

His work with the statistician Walter A. Shewhart in the 30s allows him to acquire a scientific legitimacy and his international fame in the domains of statistics and management is indisputable. It is also possible to understand Deming's philosophy by establishing direct or indirect connections with American pragmatists' philosophers from the latter quarter of the nineteenth century such as Charles Sanders Peirce, William James, Clarence Irving Lewis and John Dewey (Towns, 1997). Shewhart's and Deming's ideas concerning quality originated not solely from insights about variation within statistics but also from knowledge creation and the field of pragmatism philosophy (Antoni et al., 2001; Mauléon, Bergman, 2002, 2009) (1.1). Deming introduced his system of profound knowledge in his book *The New Economics* (1993) following *Out of the Crisis* (1986). The title of his books are provocative but they evoke especially the idea of the emergence of a new economy or that crisis would not be resolved, in his view, with mere tools and techniques but only with new thinking. He made it quite clear that the way "*out of the crisis*" was only through a deep transformation in the way we think about ourselves, about other humans, and about the world we inhabit (Johnson, 2000) (1.2).

1.1. W. E Deming¹, W. A. Shewhart and the pragmatists

William Edwards Deming (1900-1993) was an American statistician. He is regarded as having had contributions both in statistics and management. Over the course of his career, Deming received dozens of institutional and academic awards². He is one of the authors most frequently quoted during these last thirty years in three main international journals relative to the field of operations management. (Pilkington, Meredith, 2009)³. He is often credited as the management philosopher most influential in the economic recovery of post-war Japan as well as the 20th Century ascent of quality as a strategic approach (Polito *et al.*, 2004).

In 1925, Deming received an M.S. from the University of Colorado, and in 1928, a Ph.D. from Yale University. Both graduate degrees were in mathematics and mathematical physics. By its initial training, Deming was not intended to be interested in management practices of companies. But his work with his mentor Walter E. Shewhart certainly played a crucial role in the development of its career as consultant in Japan, from the 50s, then in the United States, from the 80s. At the end of his career, Deming wrote his two famous books in which he elaborated management recommendations and referred to a new philosophy. Statisticians or management advisers do not normally refer to philosophy. So what was this philosophy?

Even though he never used the term Total Quality Management (TQM), Deming is considered as one of the founding fathers of the movement. The origins of TQM are not, unlike other management modes, in the social sciences, but in the statistical theory. At the core of TQM is Statistical Process Control (SPC), which is based on sampling and variance analysis (Grant *et al.* 1994). The techniques and philosophy of quality management can be traced to W.A. Shewhart's *Economic Control of Quality of Manufactured Products*, published in 1931. For Shewhart and Deming, the notion of variation is an essential aspect of any system or process. Natural systems as industrial systems produce variations. Just as no two snowflakes are exactly alike, no two outputs from any production process are exactly alike. Shewhart clearly understood that natural processes are inherently variable and, more importantly, always seem to vary within limits. *"Thus, he believed that the outcome of a natural process can be predicted, but only within a range, not with the accuracy of a bullet hitting a target... Most remarkably... business processes, especially in manufacturing settings, should be viewed in the same new light with which modern scientists view natural processes"* (Johnson, 2000). Finally, the main message of Shewhart and then Deming was not, contrary to conventional wisdom, to reduce all the variations. On the contrary, it is necessary to understand why they exist and what they teach us. Shewhart's work must be re-positioned within the context of a new scientific paradigm, in physics and biology, where *"scientists now recognize that most physical laws are not universal but are rather statistical in nature, and that prediction therefore can only be probabilistic in most cases. They have also realized that stochastic processes operate throughout the universe, at every level, from subatomic particles to weather systems, to ocean currents, to galaxies"* (Mayr, 1988).

Shewhart was probably *"the key individual in Deming's intellectual life because he was a bridge between Deming and the philosophy of Lewis, the operationalism of Bridgman, and the statistical advances made by Fisher, Neyman and other pioneers"* (Towns, 1997). Deming devoted a whole chapter of *Out of the Crisis* to operational definitions and cited Bridgman as the source. Fisher and Neyman influenced Deming through their work or through the impact they had upon their respective disciplines (Blankenship, Petersen, 1999; Towns, *op.cit.*). In their writings, both Shewhart and Deming quote the work of the philosopher C. I. Lewis. It doesn't imply that they based their ideas on Lewis's philosophy; rather *"they saw parallels in *"Mind and the World Order"* that enabled them to put their ideas in a rational, philosophical context"* (Peterson, 1998). Finally, we cannot assert that Deming was influenced by papers of pragmatists as Peirce, James, Dewey or still psychologists as Deci, Ryan, Maslow, Herzberg, McGregor, and so on. But there is some evidence that Deming was influenced both by pragmatists and psychologists of the humanistic movement (Towns, *op.cit.*). Thus, the answer to the question on the philosophy of Deming is at first at Lewis's. Then,

¹ For a presentation of W.E. Deming, see also the site of the W. Edwards Deming's Institute (<http://www.deming.org>) and in France l'Association Française Edwards Deming (<http://fr-deming.org>).

² For instance, the Order of the Sacred Treasure, Second Class, in Japan, in 1960; the National Medal of Technology, in 1987, in USA. In 1988, he received the Distinguished Career in Science award from the National Academy of Sciences.

³ The data source for the study is the set of approximately 75,000 citations listed in the three oldest primary journals in operations management: JOM, the International Journal of Operations and Production Management (IJOPM), and Production and Operations Management (POM). Over the last 27 years, Deming arrives in 13th place among 50 authors the most known about the world in the domain.

we can suppose for reasons that we shall evoke farther⁴ that there are direct and indirect connections between the leading proponents of pragmatism and the psychologists of the humanistic movement to Deming; it is precisely these connections which allow us to understand Deming's contributions to sustainability as an area of enquiry.

C.I. Lewis borrowed from C.S. Peirce several basic ideas. His most important idea is that the knowledge doesn't have to be a purpose in itself, an experience to be contemplated with satisfaction, but the means to reach a purpose of bigger value which is of the domain of the action (Beaugency)⁵. Lewis thought that all human knowledge is founded on individual experience which consists of two elements; - an initial sense perception, followed by the mind's response to the presentation (Peterson, *op.cit.*). Also, knowledge is temporal, and that it enables us to make predictions. Finally, there are similarities between Deming, Shewhart and Lewis in the dynamic dimension of knowledge creation (Antoni, Mauléon, Bergman, *op.cit.*). Deming argued that « *rational prediction requires theory and builds knowledge through systematic revision and extension of theory based on comparison of prediction with observation* » (Deming, 1993, p. 102). Shewhart related his statement « *knowledge begins and ends in experimental data but it does not in the data in which it begins* » (Shewhart, 1939, p. 85). Lewis stated: « *knowing begins and ends in experience, but it doesn't end in the experience in which it begun* » (Lewis, 1929, p. 134). Lewis added: « *There is no knowledge of external reality without anticipation of future experience* » It was on this principle that Deming build the cycle PDSA (Plan, Do, Study, Act) (Beaugency, *op.cit.*) which we can interpret also differently⁶ (Pesqueux, 2008).

1.2. The system of profound knowledge

The system of profound knowledge is a way of thinking. His 14 points for management follow naturally as an application of this system, for transformation from the present style of management to one of optimisation (Deming, 1993, preface). This system is composed of four parts, all related to each other: appreciation of a system, knowledge of variation, theory of knowledge and knowledge of psychology. These different parts of the system cannot be separated. They interact with each other. A change in one part cause changes in other parts. Deming quotes numerous examples where the ignorance in one of four domains prevents a good understanding in the others. For example, the one who learns the theory of the variations will understand the psychology in a more complete way and the benefit of this understanding comes in how leading people. "A manager of people needs to understand that all people are different. This is not ranking people. He needs to understand that the performance of anyone is governed largely by the system that he works in, the responsibility of management. A psychologist that possesses even a crude understanding of variation ... could no longer participate in refinement of a plan for ranking people" (Deming, *op.cit.*, p. 94). Deming gives further illustrations of "entwinement" of psychology and use of the theory of variation. According to him, "statistical calculations and predictions based on warped figures may lead to confusion, frustration, and wrong decisions" (p. 95). Adapting an idea of Thomas Johnson (1992), he indicated "Accounting-based measures of performance drive employees to achieve targets of sales, revenue, and costs, by manipulation of processes, and by flattery or delusive promises to cajole a customer into purchase of what he does not need" (p. 95).

The assimilation of persons of the method of profound knowledge is, for Deming, the first stage of the transformation of a management system. This transformation requires "a view from outside" (p. 92). In chapter 4 "A system of Profound Knowledge" of *The New Economics*, Deming explains that Western organizations must transform themselves, and that a system cannot transform itself without first understanding itself. One who is part of the system cannot understand the whole without first stepping outside of it and looking in. Transformation rest upon on a new way of being, a new way of seeing change in organisations. Change begins with the adoption of new principles (to change his way of being) then with the adoption of new concepts (to change his way of seeing), and finally with the adoption of new tools and techniques (to change his way of doing things) (Boronat, Canard, 1992, 1995). According to Deming, "the individual, transformed, will perceive new meaning to his life, to events, to numbers, to interactions between people... Once the individual understands the system of profound knowledge, he will apply its principles in every kind of relationship with other people. He will have a basis for judgment of his own decisions and for

⁴ Cf 3. Deming's system of profound knowledge and sustainability

⁵ Deming et la philosophie classique par Philippe Beaugency. : www.fr-deming.org/Proj06.pdf

⁶ According to Yvon Pesqueux, PDSA Cycle and Continuous Improvement have their roots in American Pragmatic Philosophy but there is also an Oriental Perspective of Continuous Improvement from Taoism.

transformation of the organizations that he belongs to". The individual, once transformed, will: « set an example; be a good listener, but will not compromise; continually teach other people; and help people to pull away from their current practices and beliefs and move into the new philosophy without a feeling of guilt about the past"(pp. 92-93)

This view of the transformation of the individual as the prerequisite in a deep transformation of our ways of behaving with regard to our environment is compatible with some pragmatism ideas and views of sustainability. Thomas Johnson (2000) draws a parallel between the writings of both W. Edwards Deming and Gregory Bateson about the subjects of variation and sustainability in order to bring "quality management to life". He explains: "*How the world we perceive works depends on how we think. The world we perceive is a world we bring forth through our thinking. As management professor Karl Weick puts it, "believing is seeing." Which brings us back again to Deming's central message in Out of the Crisis and to Bateson's remark that most of our problems arise because of the difference between the way we think and the way nature works. This idea presaged the view espoused in the 1980s by the physicist and environmentalist Fritjof Capra (1987) who holds that the hope of the earth lies in a "new vision of reality," a "new ecological paradigm" currently emerging among scientists, philosophers, and other thinkers - one which views humans as part of a larger, interrelated whole (Capra 1987). According to E. Reitan (op.cit.), adopting a new worldview would be also both an essentially pragmatic and environmentalist idea. "The idea that the contemporary consumerist worldview is largely to blame for our current environmental crisis, and any solution to that crisis must be driven by a change in worldview- is itself an essentially pragmatic idea". For Eric Reitan, environmental thinkers such as Aldo Leopold (1949) or Arne Naess (1988) would press home this point: "Appeals to moral duty - obligations to future generations and to the fellow creatures with whom we share the planet - are insufficient. What is needed is a change in our worldview. More specifically, we need to change our view of nature and of our relationship with nature".*

2. Ethics, Pragmatism and Sustainability

To understand the contributions of the Deming system of thought in sustainability, it is necessary to understand its ethical and epistemological foundations. The question of ethics (how persons ought to act, if such question is answerable?)⁷ is implicit in Deming's system. However we note that Deming elaborated a code of ethics⁸. The question of epistemology (the nature and scope of knowledge, and whether knowledge is possible)⁹ is more explicit in his system of "Profound Knowledge", especially in his "Theory of knowledge" which is one of the four pillars of his system. By presenting a review of ethics' traditional approaches and their extensions in the field of environmental ethics we will indicate the difficulties they meet in dealing with questions of sustainability (2.1). Then we will argue pragmatism is an appropriate paradigm for business decisions which includes sustainable considerations (2.2).

2.1. Ethics and sustainability

Ethics is a branch of philosophy which seeks to address questions such as what is a good action or what is right. In the broad sense of the word, ethics is defined by Stahl and Grigsby (1997) as "*doing the right thing right the first time*". M.R Jacques (1999) uses the same definition for quality and ethics: "*doing right things right*". "*That is no operational definition, of course but it speaks to the sense of good purpose that draws people to the quality philosophy*". According to G. Zwetloost (2003), basically Corporate Social Responsibility (CSR) is focusing on the principle *doing the right things* and management systems focus on *doing things right the first time*. However, CSR is very likely to build on the management systems as well.

Ethics is generally divided into three categories: deontology, consequentialism and virtue ethics. Environmental Ethics as a branch of applied ethics have extended these traditional ethics to include the consideration of non human species. This ethics seeks to address questions such as what environmental obligations we need to keep for future generations. Indeed, according to Alain Létourneau (2010), throughout history, the ethical question focused on how to act and environmental issues arose shortly. Moral obligations related only to humans. Moral or ethical actions were considered only insofar as they affected our fellows. Thus, some have suggested the need to revise our ethics to bring

⁷ Ethics as a branch of Philosophy, From Wikipedia, the free encyclopedia.

⁸ His "Code of Professional Conduct" addresses both his obligations as a consultant in statistical studies and his expectations of his clients. It was published in *International Statistics Review* in 1972.

⁹ Epistemology as a branch of Philosophy, From Wikipedia, the free encyclopedia.

in more concern for the environment, or for living non-human species, or to species different from ours or ecosystems¹⁰.

Every ethic in some fashion must consider outcome, act and actor (Koehn, 1995). But, traditionally the various ethics are best seen as differing according to where they put their primary focus. Deontology mainly refers to Immanuel Kant who defines morality as a categorical imperative and determines goodness or rightness from examining acts. Kant argues that to act in the morally correct way, people must act from duty. Deontologists look at rules and duties. The main problem of this ethic is to know how to choose between conflicting obligations or duties, which principles should take priority when rights and duties conflict, so that deontology cannot offer complete moral guidance (Kok et al., 2001). Furthermore, the Kantian argument that we must treat all members of humanity as ends rather than means (Kant, 1785, 1997) is extended in several environmental ethics to include “rights” for animals, plants, and ecosystems (Gurdorf, Hutchingson, 2003). But by placing environmental resources as “beyond value” and as meta-ethical principles outside the realm of financial consideration, a deontological approach to environmental ethics can itself be in direct opposition to the world of business, because it constrains strategies by non-goal related criteria (York, 2009).

On the other hand, consequentialism (also known as teleological ethics) is contrasted with deontology because the rightness of an action is determined by its consequences. Utilitarianism is a consequentialist ethic. There are different types of utilitarianism. The main idea is that the moral worth of an action is determined by its outcome or by its utility. The most influential contributors to this ideology were Jeremy Bentham (1748-1832) and John Stuart Mill (1806-1873). Utilitarianism is often described by the phrase “the greatest good for the greatest number of people”; the focus is on the outcome, not on the intent, of management behaviour. Problems with this philosophy are related to defining which groups have to be involved, defining the largest number of people who benefit from decisions, and the ignoring of harm that may be done through the means used to achieve the ends (Kok et al., *op.cit.*).

Finally, according to virtue ethics, neither consequences (the outcomes) nor duties (the act himself) but “character” (the actor) should be the focal point of ethical theory. Virtue ethics is traditionally related to Aristotle who declared that a virtuous person is someone who has ideal character traits. These traits derive from natural internal tendencies, but need to be nurtured; however, once established, they will become stable. Respect, honesty, fairness are seen as virtues. *Phronēsis* is the virtue of practical thought, usually translated “practical wisdom”, sometimes as “prudence”.

Deontology and consequentialism concern themselves with the right action, virtue ethics is concerned with the good life and what kinds of persons we should be. “What is the right action?” is a significantly different question to ask from “How should I live? What kind of person should I be?” “What are proper family and social values?” Where the first type of question deals with specific dilemmas, the second is a question about an entire life. Instead of asking what the right act is here and now, virtue ethics asks what kind of person I should be in order to get it right all the time (The Internet Encyclopedia of Philosophy).

Thus, according to J.G. York (2009), “for the purpose of environmental ethics, the preservation of the environment must become one of the “virtues” or habits that lead humans to achieving a state of *eudaimonia* (happiness and fulfillment)... Humans must develop a character that leads to good environmental decisions. All decisions would be based on the principles of “character” and the development of virtuous character with regard to the environment”.

But, while this approach may be satisfactory or preferable, virtue ethics has limits. For example, it does not provide guidance on how we should act, as there are no clear principles for guiding action other than “act as a virtuous person would act given the situation” (The Internet Encyclopedia of Philosophy). And certainly, the development of one’s character should be considered, and is within a pragmatic system, however, in business issues as complex as the choices managers face in environmental issues, reducing the question to one of character would seem a vast oversimplification (York, *op.cit.*).

¹⁰ A. Létourneau (*op.cit*) quoting R.S. Routley, 2007, « A-t-on besoin d’une nouvelle éthique, d’une éthique environnementale ? », in H.S. Areissa, 2007, (ed.), *Éthique de l’environnement*. Paris, Vrin, 31-49.

2.2. Pragmatism and sustainability

Pragmatism is a school of philosophy based on the principle that the usefulness, workability and practicality of ideas, policies, and proposals are the criteria for their merit. It stresses the priority of action over doctrine, of experience over fixed principles, and holds that ideas borrow their meaning from their consequences and their truths from their verification (Encyclopedia Britannica, 2000).

The original formulation of pragmatism by C.S Peirce is that knowledge must be tested by its usefulness. C. S Peirce defined the “*pragmatic maxim*” in “*How to Make Our Ideas Clear*” (1878)¹¹ : “*Consider what effects that might conceivably have practical bearings, we conceive the object of our conception to have. Then, our conception of these effects is the whole of our conception of the object*”. This means that what we mean by a thing is what we get from it when we experience it. This means that a conception or an idea has to judge itself according to its observable consequences, the impressions that it provokes or the reactions which it arouses. Peirce’s pragmatism refers to a theory of meaning. According to this theory, we must take into account the effects that a concept or theory can be expected. For example, as shown in A. Letourneau (2010) the theory of climate change would have, according to Peirce, for significance of the effects it predicts about climate change. So if this theory provides a plurality of possible effects, of understandable fluctuations from a probabilistic perspective, this multiplicity of possible effects expectable themselves is the meaning of the theory to Peirce. Similarly, one might also wonder how sustainable development can be meaningful and effective.

William James (1842-1910) also focuses on facts, results and consequences. Nevertheless, his pragmatism does not indicate, like Peirce’s, a method of clarifying the concepts, a theory of meaning, but a theory of truth. Concerning an idea or belief, James held that one can say that “*it is useful because it is true*” or that “*it is true because it is useful*” (1907). His pragmatism is a form of consequentialism but usefulness must be understood here in the sense that “what works” in reality, and not in the sense of the interest of the individual, as in Bentham’s utilitarian philosophy. Also, James does not give the exclusiveness to human qualities who can and should be further investigated (the virtues), or to the standards or principles that remain required (deontological approaches). Ethical issues must be considered in the context of the scope of actions (Letourneau, *op.cit.*).

Whereas Peirce's pragmatism is essentially scientific, and whereas that of James’s is more psychological¹², John Dewey (1859-1952) is a social pragmatist. Dewey once noted that “*Peirce wrote as a logician and James as a humanist.*” Dewey did not identify himself as a pragmatist per se, but instead referred to his philosophy as “*instrumentalism*”. One of his main contributions to pragmatism was to emphasize the social dimension of knowledge in a democratic context. He insisted on the idea of knowledge as a tool of adaptation to the environment, essentially a human and social environment. His research mainly addressed the field of education in a democratic context. He considered that it is not important to know things from the outside, as we describe a picture, in the style of Descartes, but to see how acting, in other words, to see which usage to make of these things. As a pragmatist, he considered knowing is not seeing but acting and acting together in the specific context of education. Dewey also criticized “*the dichotomy between means and ends which he saw as responsible for the degradation of our everyday working lives and education, both conceived as merely a means to an end. He stressed the need for meaningful labor and a conception of education that viewed it not as a preparation for life but as life itself*” (Dewey, 1910; Dewey, 1938, quoted by York, 2009).

Finally, according to Alain L  tourneau (2010), pragmatism rejects the use of the word in everyday language. “Pragmatism is not what we believe”: that what matters are the outcomes and that all means, especially the most doubtful, are good. The pragmatist is not the one who does not burden himself with formal considerations, procedures and ways of doing things in order to be effective (Letourneau, 2010). It is much more of a philosophy of meaning, of truth, “*the reflexive action that makes the question of ends and means to achieve them*” (L  tourneau, *op.cit.*). Pragmatism also rejects any form of dogmatism and fosters a form of relativism. Pragmatism in ethics rejects the idea that there is any universal ethical principle or universal value. It allows us to shed the weight of utilitarian or

¹¹ « *Consid  rer quels sont les effets pratiques que nous pensons pouvoir   tre produits par l'objet de notre conception. La conception de tous ces effets est la conception compl  te de l'objet* » (1978). The article containing it was originally written in 1879 in French as “*Comment rendre nos id  es claires*” for *Revue Philosophique*,

¹² James came to philosophy by way of psychology having published *The Principles of Psychology* in 1890.

deontological principles. It holds for ethical principles being social constructs to be evaluated in terms of their usefulness (York, *op.cit.*). Man must adapt to its environment through the use of knowledge. Ideas are essentially instruments and plans of action in contrast to the conception of ideas as images and copies of impressions or of external objects. They are hypotheses or forecasts of what will result from a given action (History of Philosophy). Moreover, pragmatism argues the role of belief. For James (1896) in *“The Will to Believe”*, there are cases where a fact cannot come to be at all unless a preliminary faith exists in its coming. And where *“faith in a fact can help create a fact”*. According to L. Barbedette¹³, ideas and beliefs are used to exceed the known facts and the demonstrated theories. Pragmatism provides a significant part in the heart, feelings, desires, in our system of knowledge. Logic does not have the last word, since we believe the truth from the living experience, not by abstract concepts.

As Jeffrey G. York indicates (*op.cit.*), *“Pragmatic decision making focuses on the consideration of currently known ‘facts’ and the future consequences they may have”*. Thus *“it is not essential that business people wait on the sidelines for the debate around climate change to be settled, for new legislation to be passed, and for technology to provide solutions”*. *“Managers can choose to believe that the environmental crisis is an issue worthy of consideration and begin creating innovation today. Even in the case where the decision maker doesn’t morally believe that the environment is worthy of consideration, the fact of looming legislation, increasing concern among consumers, and rising costs of factors of production can lead to an environmentally friendly decision”*.

3. Deming’s system of profound knowledge and sustainability

Deming’s concepts of profound knowledge explicitly aim to provide guidelines for the transformation of management systems. At his time, Deming didn’t directly question “ethical” and “socially responsible” behaviour in organizations, and he didn’t evoke directly environmental issues. However, it is possible to show how his views on the role of individuals in organizational transformation can encourage such behaviour and sustainable development in organizations. The four elements of his system of profound knowledge contain requirements which can highlight his pragmatic and ethical foundations for sustainability. For Deming, the role of management is to perceive the organization as a “system” (2.1). The distinction between special and common causes of “variations” of a system is essential to understand its stability and improvement (2.2). People must also acquire a “theory of knowledge” to better act (2.3), and have a “knowledge of psychology” in order to be motivated to achieve the goals of the system (2.4). The concepts of system, variation, knowledge and motivation are interrelated. The first three component parts of the system of profound knowledge demonstrate the employment of the pragmatic method and reflect his scientific approach. The fourth component highlights the humanistic approach to his philosophy.

3.1. Appreciation for a system

Addressing sustainability and ethical problems requires an understanding of systems. According to Deming (1993), *“a system is a network of interdependent components that work together to accomplish the aim of the system. A system must have an aim. Without an aim, there is no system. The aim of the system must be clear to everyone in the system. The aim must include plans for the future”* (p. 50)...*“It must always relate to a better life for everyone”* (p. 52).

The aim of our planet, as elucidated by evolutionary theory, is resilience and sustainability, or to put it in other words, the continuation of life. While living systems have evolved to ultimately align with that aim, one very powerful system on earth – the global economy – has not (McKeon, Ranney, 2009). Deming suggested that the reason for being of a system was to improve the quality of life. In the preface of *The New Economics*, Deming wondered: *“How are we doing?... By what method could new leaders bring improvement in living?”*. The aim of any system must be clear unlike the system can not be optimized. A clear aim enables a constancy of purpose which leads to articulation of commitments and goals. The first point of Deming’s 14 points for management requires that managers *“create constancy of purpose”* so that the organization will be a system in the long run. Deming said: *“your customers, your suppliers, your employees need your statement of constancy of purpose – your intention to stay in business by providing product and service that will help man to live better and which will have a market. Top management should publish a resolution that no one will lose his job for contribution to quality and productivity”* (1986, p. 26). Being explicit about beliefs and commitments is a crucial first step toward behaving ethically (Nayebpour, Koehn,

¹³ L. Barbedette, www.encycopedie-anarchiste.org/articles/p/pragmatisme.

2003) and sustainably. Moreover, a clear aim provides for collective and cooperative effort and allows preserving a community of interest.

The performance of a system with regard to its aims will be suboptimal if each part is optimized without an understanding of the interdependencies of all parts working together. Effectiveness of connections and communications between processes can be, at least, as important as the performance of the individual processes. To optimize the system, management must be fully aware of the interdependencies and interactions between system components. Now, the greater the interdependence within a system, the greater the need for clarity of and alignment with system aim, and the greater the need for communication and cooperation there within. According to Deming (p. 81), interdependencies are far stronger in a system like a company, than they are in other systems such as an orchestra or a bowling team.

“An example of a system, well optimized, is a good orchestra. The players are not there to play solos as prima donnas, each one trying to catch the ear of the listener. They are there to support each other. Individually, they need not be the best players in the country” (p.80).

Also, as indicated by Andrew J. McKeon and Gipsie B. Ranney (*op.cit.*) in taking this example, what seems wasteful or inefficient from the perspective of one aim (the fact that some musicians do not play! or are not profitable!)¹⁴ may seem sensible or indeed necessary when viewed from another (the playing of beautiful music !). And what may seem to make sense in the short-term – an efficient orchestra – may prove to be unsustainable in the long term since nobody wants to hear an efficient orchestra. Thus, the authors show how this reasoning may be applied to the case of reducing and capping carbon emissions.

”Much as the idle musician is out of alignment with the aim of an efficient orchestra, capping carbon emissions is out of alignment with the aim of a cheap energy economy. Capping carbon emissions can only serve to increase the cost of fossil fuels – clearly in conflict with maintaining low energy prices in the short-term. Yet scientists are warning with ever increasing urgency that human industry must stop emitting vast amounts of carbon dioxide into the atmosphere or else the earth’s climate system may become unstable. If the more urgent aim for the global economic system is sustainability for the long-term rather than cheap energy in the short-term, then constraining carbon emissions is not only sensible, it is necessary and indeed urgent » (McKeon, Ranney, *op.cit.*).

Finally, the systemic perception of the organization described by Deming implies a broadening of ethical horizons. What Deming asked of management is ultimately new personal skills, a new, more holistic, systemic way of thinking. It is to perceive the organization as a whole which is more than the sum of its parts, and whose interactions need to be fully understood.

First, Deming considered the company as an open system and stressed the importance of cooperation and collaboration as well as competition. For example, he was keen that there should be a minimum of Government regulation of agreed standards in a given industry. He called for co-operation between organisations in industry and commerce to achieve the said standards by voluntary agreement, relieving government of the detailed bureaucracy and enabling the needed changes to take place efficiently, over time (Peterson, 1998). Also, Deming strongly emphasised that competition works best inside a system of co-operation (Peterson, *op.cit.*) or promoted forms of “coopetition” when he advocated “*cooperate on common problems then compete*” (Deming, 1991, quoted by McKeon, Ranney, *op.cit.*)¹⁵. At the level of an organization, adopting a systemic way of thinking amounts to no longer focusing only on certain issues, but to receive a set of problems including ethical issues (Roth, 1993). Finally, at the individual level, we often make judgments about people, especially to judge their intentions or the consequences of their actions and to neglect other important aspects of ethics. Sometimes we condemn an agent or an action without stopping to consider why the person committed the action in the first place we fail to ask, for example, that we could have done instead of a person having committed a fault, that we could possibly do to help (Nayebpour, Koehn, 2003). Deming encourages such proaction, rather than reactive or preventive behaviours or warnings when he highlights the characteristics of the personal leadership required to help people to optimize the system: *« he helps people to see themselves as components in a system... he is coach and counsel not a judge... a manager of people knows that in a stable state it is distracting to tell the worker about a mistake” »* (1993, p. 125).

¹⁴ We might wonder why the French horn section is paid to do nothing while the cellists and oboists are kept busy – or wonder why the rest of the organization sits idle during long piano and violin solos (McKeon, Ranney).

¹⁵ Deming, W. Edwards, Lectures at Columbia University, Spring, 1991.

3.2. Knowledge about variation

« Life is variation. Variation there will always be, between people, in output, in service, in product... No two people are alike. Arrival of a train or of an aeroplane varies from day to day. Time en route to work varies day to day, no matter what be the mode of transport... » (Deming, 1993, p. 98, p. 207). A production process contains many sources of variations in materials, tools, machines, operators and environment. “Measured amounts of carbon dioxide and other greenhouse gases in the atmosphere, surface temperatures on land and in the ocean, number of hurricanes, number of tornadoes and other climatic indicators vary from year to year. We are surrounded by variation. Since this is the case, how do we make sense of the numbers that come our way? What do the fluctuations in the numbers mean? Do we ascribe too much meaning or too little to the fluctuations? Can we use the numbers to predict with a high degree of belief what the future holds? What kinds of actions should we take to change the future? These kinds of questions have importance to managers of business and to inhabitants of the earth. Some understanding of variation can be helpful to answer those questions” (McKeon, Ranney, 2009).

Deming believed that excessive variations were most of the time, sources of problems and, therefore, it is preferable, all things being equal, reduce variation, or at least understand them. Reducing variation is to avoid irregularity when possible. « Most people prefer certainty to uncertainty, prefer predictability to unpredictability, prefer to receive services or information when expected rather than too early or too late, and prefer not to be surprised or hassled. They prefer a world in which outcomes closely conform to their expected targets, a world of less » (Hillmer, Karney, 2001). Moreover, the main message is not so much to reduce variation but to know what variation is trying to tell us about systems and the people that work in¹⁶. Deming’s ideas about variation were based on the work of Shewhart (1931), who suggested it was important to distinguish between two fundamental causes of variation of any system (or process): common causes and special causes¹⁷ :

- On the one hand, the common causes are part of the system. These are numerous causes whose presence is systematic / chronic and, separately, have little impact on results. They cause natural variation that can be expected within certain limits. They will remain unless the system is altered.
- On the other hand, special causes are not part of the system. These are few causes but have a significant effect. These are specific causes, often unpredictable but can be identified and eliminated. Their removal requires focused, immediate action rather than a fundamental system change.

Given the distinction between common and special causes, Deming (1986) observed, “in my experience most troubles and most possibilities for improvement add up to proportions something like this: 94% belong to the system (responsibility of management) 6% special” (p. 315). The vast majority of problems in organizations therefore comes not from employees but from management. Ethically, this sharing of responsibilities between management and employees has at least two advantages. Promoting a community of interest by checking the human tendency to find a “scapegoat” (Girard, 1989). Also, people are more likely to cooperate, to want to work with each other if they do not feel they are being singled out for blame or demonized (Nayebpour, Koehn, 2003). Moreover, the confusion between common and special causes and, more generally, ignorance of what a stable system is also have ethical implications. A process may be in statistical control; it may not be. In the state of statistical control, the variation to expect in the future is predictable. Costs, performance, quality, and quantity are predictable. The process has only common causes. In other words, it makes no sense to try to find specific reasons or causes. If the process is not stable, then it is unstable. Its performance is not predictable. It contains special causes that must be identified and eliminated. One must wonder what happened, what caused the change and how to intervene in the process.

Deming highlighted two mistakes frequently made in attempting to improve results, both costly.

- To react to an outcome as if it came from a special cause, when actually it came from common causes of variations.

¹⁶ According to H.R. Neave (1990, p.57), Deming’s message would be that one: « if I had to reduce my message for management to just a few words, I’d say it all had to do with reducing variation ». However, Deming insists in his book of 1996 on the need to understand the variations. Also, in an interview on education, Deming said with force and some kind of plot on three occasions, he never said that we should reduce the variations but in some cases it is possible, in others not: « I didn’t say reduce it. Sometimes, you would, sometimes you wouldn’t... You better have a theory. If you have a theory then you know the answer there » (<http://daytonos.com/deming>).

¹⁷ For an overview of statistical process control, see especially F. Canard (2009) or more specialized works on the subject.

- To treat an outcome as if it came from common causes of variation, when actually it came from a special cause (Deming, p. 99).

The first mistake is to act in relation to a problem (a defective product, a customer complaint, a mistake, a breakdown, an accident ...) as if the problem was specific, unusual, when it actually is a chronic problem, due to common causes. Then, the management is led to act on what is deemed responsible, while he would act on the system, but without haste, because we know that this type of action often requires a thorough study (Cavey)¹⁸. Deming uses the term "*tampering*" which means the tendency to take action, often leads to action without reason and which causes more problems than it fixes. Tampering is taking action based on the belief that a common cause is a special cause. In Chapter 9 of his book in 1993, Deming illustrates "*the losses that are caused by tampering-management by results*" (p.190). More recently, Johnson H. Thomas (2006) shows through his notion of performance management "*management by means*" why focusing on results is not the best way to achieve results. "*Setting production objectives that exceed the system's means may produce short-term results but inevitably degrade the system itself*". In Chapter 8, Deming shows how social and environmental problems (pollution, fires ... accidents at work, absenteeism ...) can be mistakenly viewed as special causes and involve hasty judgments and the research of personal responsibilities: « *Every suit for malpractice in medicine, or in engineering or accounting, implicates the event to a special cause – somebody was at fault* ». Deming provides at least twenty examples of tampering in this chapter¹⁹.

The second mistake, unlike the previous one, is to acting on a common cause, to change the system, when it actually would be better to act directly on the specific cause. This implies that we can know "statistically" through control charts that it is indeed a special cause and not a common cause. Changing a system on the basis of a special cause can damage the system and add cost.

Knowing, by using control charts, the distinction between common and special causes of variation of any system is an important element of decision making. It highlights the awareness that the actors may have of the consequences of their actions. On the contrary, disregard of this distinction can lead to errors of judgment causing or perpetuating unjust conducts which weaken a community of interest. Finally, actors may be persuaded to adopt a more reasonable conduct, the sense of prudence or practical wisdom of Aristotle. This prudence can not only choose when there are several possibilities but also to decide knowingly when it is appropriate to devote time and energy to the choice (Campodonico, 2008).

3.3. Theory of knowledge

The third part of Profound Knowledge is the theory of knowledge which is concerned with the nature and scope of knowledge. Deming was influenced by C. I. Lewis and the other pragmatists who stated knowledge is predictive and probable only, it is built on theory. Pragmatists argue that theories are instrumental, intended to be tested in experience for validation and verification. Deming thought that management's job is prediction and prediction is based on theory. Concretely, introducing a new product or service, determining which customers will buy the product, how they will use it and what needs it will fulfil requires prediction. "*Even the simplest plan – how I may go home tonight – requires prediction that my car will start and run, or that the bus will come, or the train*" (Deming, 1993, p. 102). Then, we have to establish on what basis our prediction is being made. The theory behind our train for our journey home is the existence of a timetable, modified by our experience of how reliable the actual delivery of the train service. The theory behind new products will be the research and testing that we have carried out amongst potential customers. In the words of Nigel Clements "*Without theory there is nothing to revise... experience has no meaning... one has no questions to ask... Hence... there is no learning. Without a train timetable, the fact that a train appeared at 3pm yesterday tells you nothing about tomorrow. Without a timetable, one cannot ask the*

¹⁸ C. Cavey, un chemin vers la qualité : <http://www.fr-deming.org/MemoireCavey.pdf>

¹⁹ Some of these include reactions to a complaint of a customer, adjustments in interest rates made by the Federal Reserve Board, a reaction to stock market news, changing company policy based on the latest attitude survey... Others include nuclear proliferation, barriers to trade, illicit drug enforcement... See Deming (1993, Chapter 8). See also <http://maaw.info/ArticleSummaries/ArtSumDeming93.htm>

question “At what time is the train?” Without a timetable, one cannot form a judgement about the reliability of the service”²⁰.

For Deming, knowledge, continual learning and unmeasurable quantities are important in management decision making (Hillmer, Karney, 2001). Prediction and learning are crucial elements for managers to lead their organizations ethically and sustainably and for the employees to carry out their daily activities. It is also necessary to understand why some performance factors unmeasured and unmeasurable are so important in decision-making.

Learning must be continuous. It is viewed as an essential moral value to be integrated into individuals’ day-to-day activities: « *Everyone might well ask himself every day what he has done this day to advance his learning and skill on this job, and how he has advanced his education for greater satisfaction in life* » (Deming, 1986, p. 50). Also, according to S.C. Schneider et al. (2005), socially responsible behaviour is a way of being and therefore must be integrated into the decisions and daily actions. Moral considerations must be integrated continuously by individuals. Finally, according to Deming, organizational knowledge is not only data and measurable quantities.

Good management requires more than data and visible results. Some of the most important factors in the management of organizations are often not measured and may not be measurable. Behind this assumption is the idea that “*what cannot be measured cannot be managed and what cannot be measured is not important. While it is important to develop valid measurements to help managers do their jobs more effectively, that does not mean that the lack of a measurement corresponds to a lack of importance*” (Hillmer, Karney, *op.cit.*). In the words of Deming: “*It is wrong to suppose that if you can’t measure it, you can’t manage it – a costly myth*” (1993, p. 35). Deming (1986) cited several examples of important factors unknown or unknowable including the multiplying effect of an unhappy customer or of a happy customer, the loss of employees’ motivation because of having to do unsatisfying work or alternatively the psychological satisfaction they can derive from their work. For J. Pfeffer (1994, 1998)²¹, the benefits of creating an environment conducive to the pride of employees at work are considerable. When managers make decisions that impact on these dimensions, the effect will often not be quantifiable at the time the decision is made and may never be known. However, these decisions must be taken and managers who fail to take into consideration these factors that are not quantifiable will not make decisions do as effective as they should. For H. Thomas Johnson (1998), “*Relationship can’t be measured....In a life system, reality is not defined by objects that we measure; rather, it is defined by unmeasurable relationships that give rise to the systemic properties that we find interesting, including business results*”. Finally, A. J. McKeon and G. B. Ranney, (*op.cit.*) indicates that we must consider delayed effects of actions: “*Currently, we see the delayed effects of past actions. These effects include ongoing difficulties in the Middle East, unpredictable fluctuations in energy prices, degradation of the environment, and climate change. Lack of attention to potential future effects of actions we take can lead to devastating consequences. The consequences of climate change lie in the future but the costs to address them – both financial and political – must be borne in the present. Changes by management to address climate change may not take effect for months or even years. The immediate effect may be negative to the bottom line. But management needs to be guided by consideration of potential future losses as much as by the next quarter’s numbers if they wish the company to survive and prosper*”.

Globally, Deming indirectly highlights the problem of significant actions in terms of ethics, corporate social responsibility or sustainable development that could not be undertaken, either because they do not produce visible effects in the short term, or because they do not produce any visible effects. There is also the problem of the impact of actions which qualitative aspects are difficult to take into account while quantifiable dimensions are easier to use (Capron, Quairel-Lainoizelée, 2006).

²⁰ Dr W. Edwards Deming’s System of Profound Knowledge, Nigel Clements PRISM Consultancy International: www.prismconsultancy.com

²¹ Quoted also by Hillmer, Karney, 2001.

3.4. Psychology

Deming believed « *management of industry, education and government operate today under the supposition that all people are alike* ». Psychology help managers to understand « *people are different from one another. A manager of people must be aware of these differences, and use them for optimization of everybody's abilities and inclinations . . . People learn in different ways, and at different speeds* » (1993, p. 111). To Deming's view, it is also important to know what motives people, what are the sources of their action. Social and educational psychologists have been studied different form of motivation. There are many supports for Deming's ideas about intrinsic motivation in the works of psychologists of the humanistic movement as E.L. Deci and R.M. Ryan, A.H. Maslow, F. Herzberg and also pragmatists as J. Dewey and A. Kaplan (Towns, 1997). Intrinsic motivation can foster socially responsible behaviour and enables people to act in a sustainability way.

Deming had a positive view of people. He believed the most important motivation comes from inside the person what psychologists call intrinsic motivation. Deming (1993) suggested "*people are born with a need for relationships with other people, and need for love and esteem by others*" (p. 111). The assumption that, in general, people have the desire for self-esteem and to make a meaningful contribution to society can be seen in the motivational theories of many authors. For example, Maslow (1943) suggests that individuals seek to become self-actualized and to function autonomously. Herzberg (1987) highlights two different needs of human beings: the need to avoid pain from the environment like hunger and the need to experience psychological growth through achievement. Herzberg's two-factor theory suggest that the factors involved in producing job satisfaction (and motivation) are separate and distinct from the factors that lead to job dissatisfaction ("*the opposite of job satisfaction is not job dissatisfaction...*"). Deci and Ryan (1985) suggest that people are intrinsically motivated by needs for competence and self determination. Deming believes that the main source of motivation is intrinsic to the individual and that the emphasis on extrinsic motivation has a destructive effect. "*One is born with intrinsic motivation, self-esteem, dignity, cooperation, curiosity, joy in learning. These attributes are high at the beginning of life, but are gradually crushed by the forces of destruction. These forces cause humiliation, fear, self-defense, competition for gold star, high grade, high rating on the job. They lead anyone to play to win, not for fun. They crush out joy in learning, joy on the job, innovation. Extrinsic motivation (complete resignation to external pressures) gradually replaces intrinsic motivation, self-esteem, dignity*" (Deming, 1993, p. 125).

Thus, the effects of intrinsic and extrinsic motivation are not additive although Deming acknowledges that motivating people is not so simple (Hillmer, Karney, 1997). "*Some extrinsic motivation helps build self-esteem. But total submission to extrinsic motivation leads to destruction of the individual. Joy in learning is submerged in order to capture top grades. On the job, under the present system, joy in work, and innovation, become secondary to a good rating. Extrinsic motivation in the extreme crushes intrinsic motivation*" (Deming, 1993, p. 111).

Intrinsic motivation is also one of the key features of socially responsible behaviour (Schneider et al., *op.cit.*), that is to say, voluntary behaviours that benefit others ("*prosocial behaviour*") without the expectation of external rewards and without necessarily being self sacrificing (Eisenberg, 1996). For B. Shamir, R.J. House, M.B. Arthur (1993, p. 580) motivation derives from self-identity. "We 'do' things because of what we 'are', because by doing them we establish and affirm an identity for ourselves". Finally, we can also see with C. Towns (1997) similarities between the human approach of Deming's philosophy and John Dewey's pragmatism. According to Towns, Deming and Dewey have a mutual position considering the company's rewards and materialism as an expression of individualism that manifests itself in the Western world. Deming referred to "*forces of destruction*" that were all manifestations of the extreme individualism apparent in the western world and, in particular, the United States. Moreover, Dewey called for the development of a "*new individualism*" in which social responsibility would be paramount and that it would be necessary to counter the extreme individualism of the nation (Towns, *op.cit.*). Similarly, Deming wrote of the "*restoration of the individual*": "*The transformation will take us into a new method of reward. We must restore the individual, and do so in the complexities of interaction with the rest of the world. The transformation will release the power of human resource contained in intrinsic motivation...*" (Deming, 1993, p. 126). He hoped for the end of a "*rugged individualism*": "*The new philosophy requires leadership, we need to think in terms of win-win. There was a time for rugged individualism. It was not wrong. Times have changed*". Now the emphasis is on teamwork (Deming, 1986; Scherkenbach, 1986, Anderson et al. 1994). Finally, Deming saw that the exploitation of America's natural resources as short sighted and ill conceived (Towns, *op.cit.*). He felt that the true natural resource, the human resource, had been sorely neglected. "*We have been wasting our natural resources, and worse, as we shall see, destroying our people*" (Deming, 1993).

Conclusion

The aim of this research was to clarify the implicit assumptions of Deming's system of profound knowledge and see how his recommendations on the role of individuals and the transformation of management systems can promote socially and sustainably responsible behaviour. Each of the four interrelated components of the system contains prescriptions for which we could highlight the links between ethics and sustainability. The guiding principle of our research was the following. Finding connections between main pioneers of the pragmatist movement to Deming, arguing pragmatism is an appropriate paradigm for some sustainable issues, and finally establishing a link between the system of profound knowledge and sustainability.

It appears that Deming was above all a pragmatist through the ideas he shared with Shewhart and his references to the work of Lewis. We assumed that Deming also had common positions with Peirce, James and Dewey probably. Moreover, the philosophy contained in the Deming system of profound knowledge would be both a scientific and humanist philosophy. The first three pillars of this system refer to the scientific version of his philosophy due to « *his reliance upon statistical, operationalist and pragmatic methodologies* » (Towns, 1997). They correspond to the "hard" areas of systems (appreciation for a system), scientific knowledge (theory of knowledge) and the use of data (knowledge about variation) (Peterson 1998). The fourth pillar of the system of profound knowledge (psychology) reflects the human approach of Deming's philosophy where we find some elements in the pragmatist Dewey, in particular the desire to restore the individual and to appeal strongly to a better use of natural resources, especially human resources.

We could also indicate that the assimilation of the Profound Knowledge by each individual for organizational transformation is based fundamentally on a new way of representing itself to the world, our relations with others and with nature. Pragmatism, seen as a philosophy and ethic, cannot be confused in the sense that it sometimes gives in to everyday language: prioritizing outcomes at the expense of means. It should be viewed as a philosophy of action involving a reflection on both outcomes and means. From this point of view, it could provide an appropriate framework to address environmental issues and sustainable development (York, 2009). Furthermore, at the present time, a new field of research called *Environmental Pragmatism* is developing (Létourneau, 2010).

Finally, there are several limitations to our research that may provide some avenues for future research. First, Deming's system of profound knowledge requires an understanding of systems. Deming recommends that we act on a system-wide basis which is a view generally accepted to address sustainability (McKeon, Ranney, 2009). He also shows that at least 94% of organizations' problems come from management, less than 6% come from problematic behaviour. The system, not vicious individuals, is alleged to be the primary source of unethical conduct (Petrick and Manning, 1993). Although it is clear that the system can prevent managers from managing ethically or detrimentally towards the environment, it is also clear that some issues arise from the individuals themselves through deviant behaviours. It should also consider situations where individuals do not wish, by choice, to contribute to the company or society. To the extent that Deming locates all viciousness in the process or system and ignores the crucial role played by individual choice, it misses the ethical mark (idea adapted from Nayeypour, Koehn, 2003). Secondly, it is difficult, for different reasons, for organizations to change their management practices in accordance with Deming's advice (Hillmer, Karney, 2001) but we do need an approach to evaluate whether or not applying Deming's principles of management is a reasonable course of action. Most of the frameworks for quality and performance excellence (international quality awards and standards)²² today are designed as systems with aspects related to sustainable development. From this point of view, it is worthwhile to first explore the contributions and limitations of these frameworks in relation to sustainable development, especially at an individual level. On the other hand, it would be appropriate to consider the views of Deming on quality awards and standards in general. Finally, Deming was influenced by the American pragmatists. He also spent many years in Japan and we have indicated that he was widely recognized as the most influential in the economic recovery of post-war Japan. We also know that Shewhart and Deming PDSA model of continuous improvement is not universal and can be interpreted in different cultures (Pesqueux, *op.cit.*). For example, as indicated by the author, the notions of action and experience have a very different meaning in the East and West. Thus, there may be an Oriental view of Deming's philosophy in relation to issues of sustainability?

²² For example, The Malcolm Baldrige National Quality Award, The Deming prize, The European Quality Award, and so on... or ISO 26000 standard on social responsibility.

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